

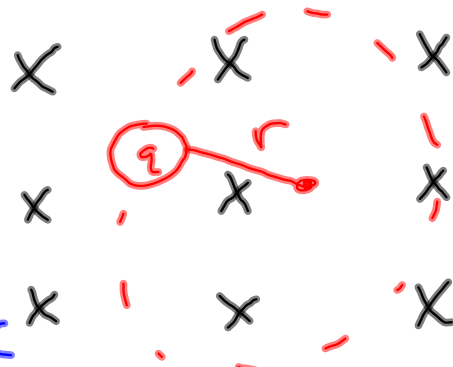
HW:

p. 830: 1, 3, 5, 9, 11

Magnetism Notes and Practice Problems 11.29.11 AP Physics

A proton is moving in a circular orbit of radius 14 cm in a uniform 0.35 T magnetic field perpendicular to the velocity of the proton. Find the speed of the proton.

What would happen to the radius of orbit if an electron were moving at the same speed as the proton?

$$\begin{aligned} r &= .14 \text{ m} \\ B &= .35 \text{ T} \\ q &= 1.6 \times 10^{-19} \text{ C} \end{aligned}$$
A diagram showing a proton (represented by a red circle with a '+' sign) moving in a circular orbit in a magnetic field. The magnetic field is represented by 'X' marks, indicating it is directed into the page. A dashed red line shows the circular path of the proton, with a red arrow indicating the direction of motion. A red line segment labeled 'r' connects the proton to the center of the orbit.

$$m_p = 1.67 \times 10^{-27} \text{ kg}$$

$$r = \frac{mv}{qB}$$

$$v = \frac{qB}{rm}$$

$$= 4.7 \times 10^6 \text{ m/s}$$

Magnetism Notes and Practice Problems 11.29.11 AP Physics

In an experiment designed to measure the magnitude of a uniform magnetic field, electrons are accelerated from ~~rest~~ through a potential difference of 350 V and then enter a uniform magnetic field that is perpendicular to the velocity vector of the electrons. The electrons travel along a curved path because of the magnetic force exerted on them and the radius of the path is measured to be 7.5 cm. What is the magnitude of the magnetic field?

$$\Delta K + \Delta U = 0$$

$$\frac{1}{2}m_e v^2 + q \Delta V = 0$$

$$v = \sqrt{\frac{-2q \Delta V}{m_e}}$$

$$= 1.1 \times 10^7 \text{ m/s}$$

$$r = \frac{mv}{qB}$$

$$B = \frac{mv}{q r}$$

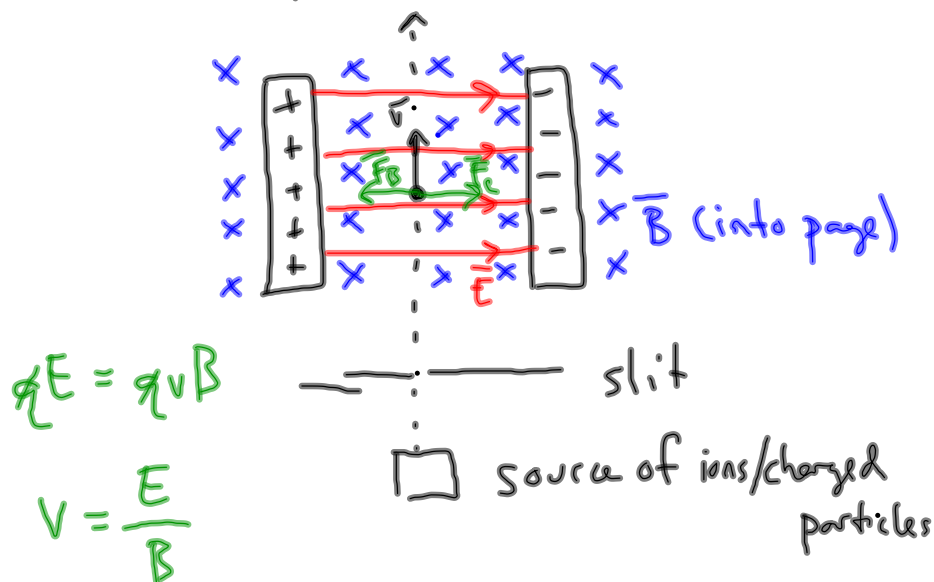
$$= 8.4 \times 10^{-4} \text{ T}$$

Applications of Moving charged Particles:

Lorentz force:

$$\vec{F} = q\vec{E} + q(\vec{v} \times \vec{B})$$

1) Velocity Selector



2) Mass Spectrometer

$$r = \frac{mv}{qB}$$

3) Cyclotron